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Person, Place, and Time

Seattle Epidemiology and
Biostatistics Summer Session
June, 2004

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Some uses of descriptive epidemiology

Use	Example
Detect emerging threats to public health	SARS
Find clues to etiology and opportunities for prevention	AIDS
Help target screening efforts	Mammography for breast cancer
Inform planning of health services	Number and distribution of CCU beds
Aid to diagnosis	“Coin lesion” on chest X-ray

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Person

4

Often important and available

- Age
- Gender
- Race/ethnicity
- Marital status
- Socioeconomic status
  - Income
  - Education
  - Occupation

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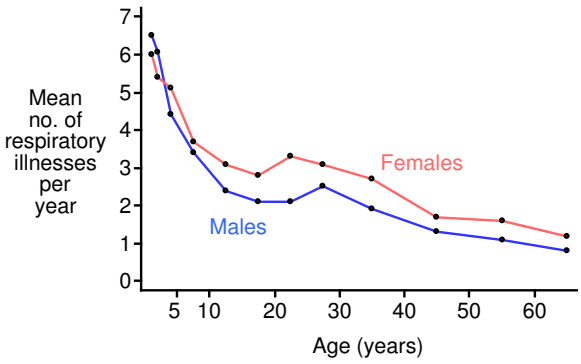
Incidence of respiratory illness by age and sex



(Source: *JAMA* 1974; 227:164–9)

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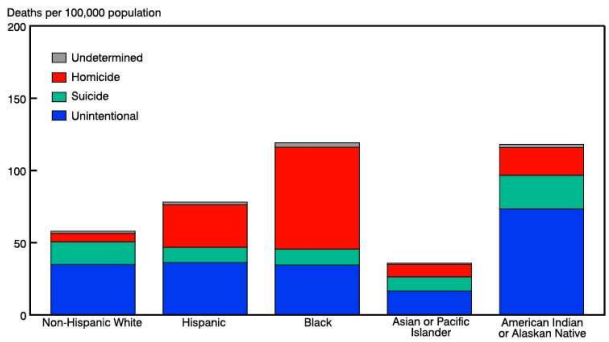
Injury mortality by race/ethnicity in U.S.



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Place

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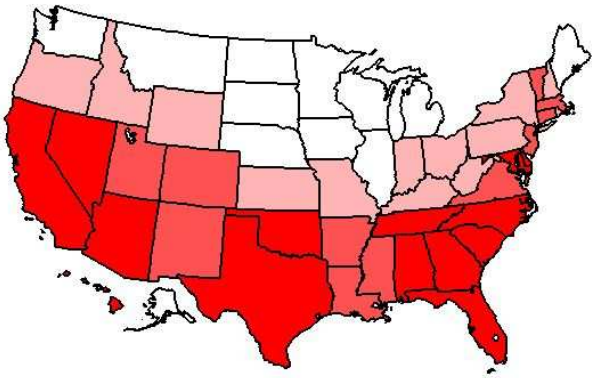
Mortality from malignant melanoma by state



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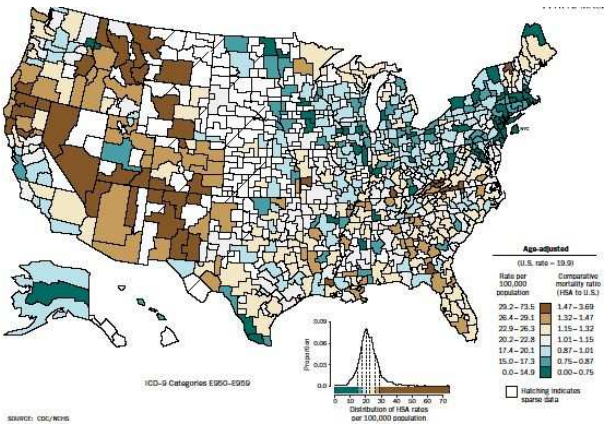
Mortality from suicide by health service area



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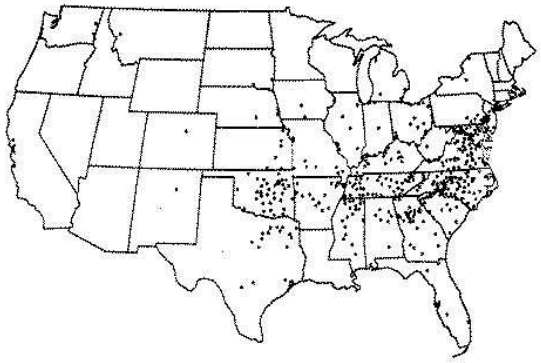
What's the disease?



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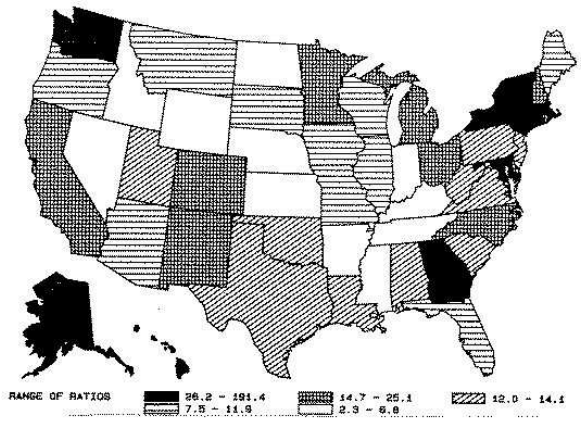
What's the condition?



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Time

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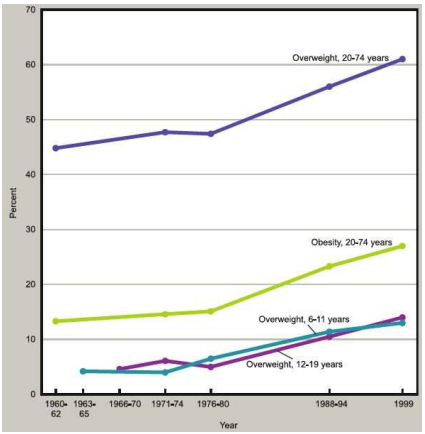
Secular trends in prevalence of obesity



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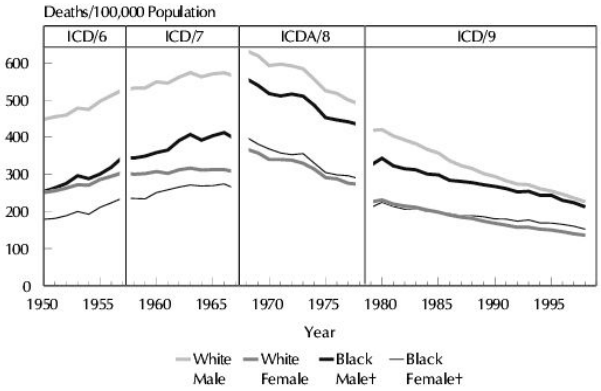
Secular trends in coronary heart disease mortality



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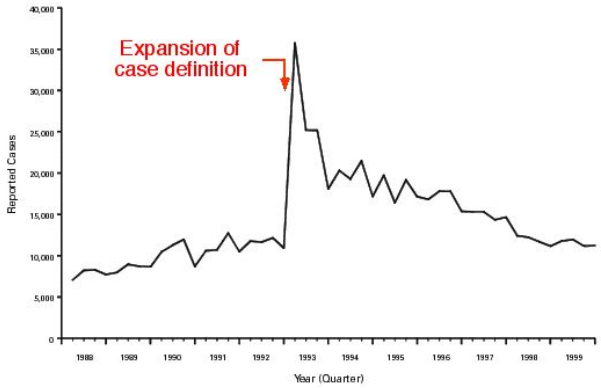
Secular trend in reported U.S. AIDS cases



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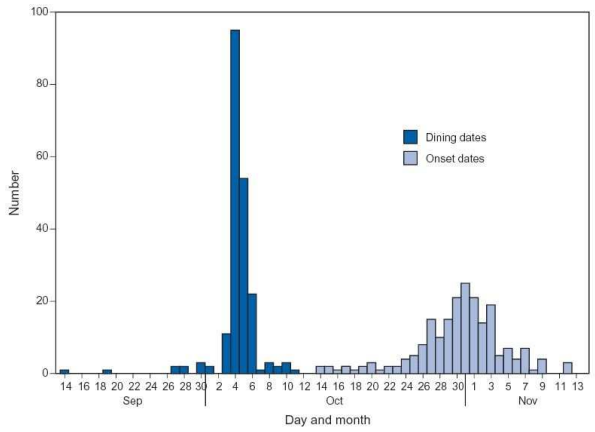
Hepatitis outbreak: Monaca, PA, 2003



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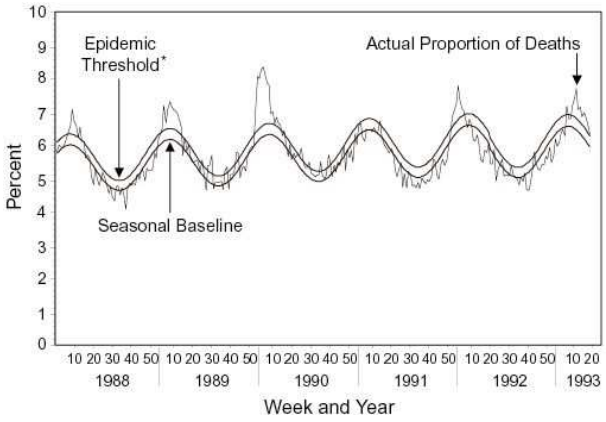
Seasonality: pneumonia and influenza deaths



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Lung cancer mortality in U.S. women—1

	Mortality rate*		
Age (yrs)	1975	1985	1995
35-44	7.3	5.7	5.1
45-54	28.1	36.0	30.0
55-64	58.3	94.3	104.5
65-74	67.6	144.9	204.5
75-84	70.8	134.9	244.5
95+	71.5	103.7	186.8

*Deaths per 100,000 person-years

- Two time scales shown: *age* and *calendar year*

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Lung cancer mortality in U.S. women—2

	Mortality rate*		
Age (yrs)	1975	1985	1995
35-44	7.3	5.7	5.1
45-54	28.1	36.0	30.0
55-64	58.3	94.3	104.5
65-74	67.6	144.9	204.5
75-84	70.8	134.9	244.5
95+	71.5	103.7	186.8

*Deaths per 100,000 person-years

- Comparisons within a *row* keep age fixed, focus on how age-specific rates varied by calendar year

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Lung cancer mortality in U.S. women—3

	Mortality rate*		
Age (yrs)	1975	1985	1995
35-44	7.3	5.7	5.1
45-54	28.1	36.0	30.0
55-64	58.3	94.3	104.5
65-74	67.6	144.9	204.5
75-84	70.8	134.9	244.5
95+	71.5	103.7	186.8

*Deaths per 100,000 person-years

- Comparisons within a *column* keep calendar year fixed, focus on how rates varied by age within a given year

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Lung cancer mortality in U.S. women—4

	Mortality rate*		
Age (yrs)	1975	1985	1995
35-44	7.3	5.7	5.1
45-54	28.1	36.0	30.0
55-64	58.3	94.3	104.5
65-74	67.6	144.9	204.5
75-84	70.8	134.9	244.5
95+	71.5	103.7	186.8

*Deaths per 100,000 person-years

- As 10 calendar years pass, people age 10 years
- Hence base population is (largely) the same for cells along a *diagonal path*
- Such a group is a *birth cohort*: members were born in the same 10-year period

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Lung cancer mortality in U.S. women—5

Age (yrs)	Mortality rate* 1975	1985	1995
35-44	7.3	5.7	5.1
45-54	28.1	36.0	30.0
55-64	58.3	94.3	104.5
65-74	67.6	144.9	204.5
75-84	70.8	134.9	244.5
95+	71.5	103.7	186.8

*Deaths per 100,000 person-years

- Each parallel diagonal path tracks the experience of a different birth cohort

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Why consider birth cohort?

- Shared experiences at an earlier age can affect future disease risk—e.g.:
  - Perinatal exposures: diethylstilbestrol in utero
  - Military service in wartime
  - Crack cocaine use
- Can provide a simple explanation for otherwise puzzling pattern of variation in rates by age

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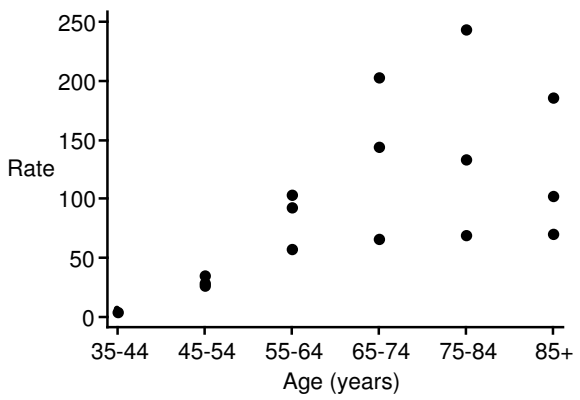
Lung cancer death rates



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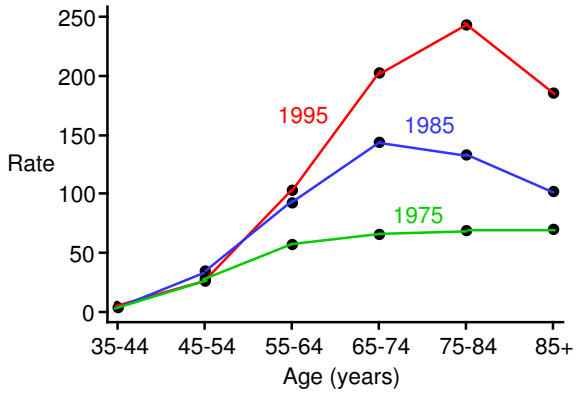
Connected by calendar year of death



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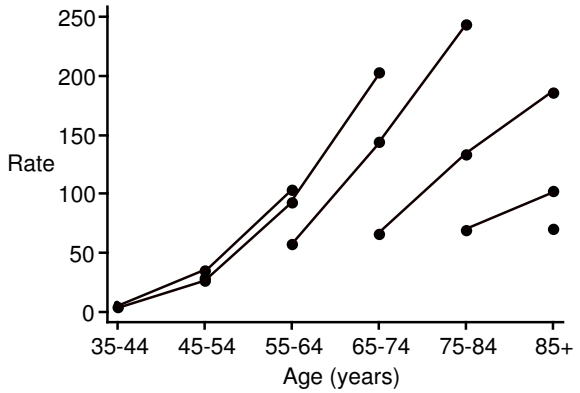
Connected by birth cohort



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Interrelatedness of the 3 time scales

- $\begin{pmatrix}\text{Calendar}\\ \text{year}\end{pmatrix} = \begin{pmatrix}\text{Year of}\\ \text{birth}\end{pmatrix} + \begin{pmatrix}\text{Age in}\\ \text{years}\end{pmatrix}$
- Once any two values are specified, third is fixed and cannot vary

Introduction to Epidemiologic Methods — Summer, 2004
Discussion Questions: Person, Place, and Time

1. The questions below are based on the following article:

   Mokdad AH, Ford ES, Bowman BA, Dietz WH, Vinicor F, Bales VS, Marks JS. Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. JAMA 2003; 289:76–9.

   (a) Based on this article, in what sense can the term "epidemic" be validly applied to obesity and diabetes in the U.S.?

   (b) What were the main advantages of using data from the Behavioral Risk Factor Surveillance System (BRFSS) for this descriptive epidemiologic study?

   (c) What other national survey data might have been used to address the same research questions? What advantage(s) might they have offered?

   (d) In a similar *JAMA* article two years earlier, these authors concluded by stating: "To control these dual epidemics, now is the time for implementing multicomponent interventions for weight control, healthy eating, and physical activity." What additional evidence would be needed to justify that course of action?

2. The table below is drawn from yet another *JAMA* paper on the increasing prevalence of obesity in the U.S. Examine the age-specific prevalences of obesity in 1998. One possible interpretation of the pattern seen is that, on average, people's weight increases steadily during early adulthood until they reach their 50's. After that age decade, their body weight tends to decline when they are in their 60's and to fall even more sharply when they are in their 70's.

   However, at least two other possible explanations should be considered for the observed pattern of variation in obesity prevalence in relation to age. What are they? Assume for present purposes that the accuracy of self-reported weight and height does not vary by age, and that the changes in height with age are small enough to be ignored.

Table 1: Changes in obesity prevalence in adults by selected characteristics

Characteristic	Prevalence per 100 1991	1998	Difference	% increase
Gender				
Men	11.7	17.7	6.0	51.5
Women	12.2	18.1	5.9	47.4
Age (years)				
18–29	7.1	12.1	5.0	69.9
30–39	11.3	16.9	5.6	49.5
40–49	15.8	21.2	5.4	34.3
50–59	16.1	23.8	7.7	47.9
60–69	14.7	21.3	6.6	44.9
70+	11.4	14.6	3.2	28.6

Source: Mokdad AH, Serdula MK, Dietz WH, Bowman BA, Marks JS, Koplan JP. The spread of the obesity epidemic in the United States, 1991–1998. JAMA 1999; 282:1519–22